

## ***Interactive comment on “Abyssal plain hills and internal wave turbulence” by Hans van Haren***

**H. van Haren**

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Received and published: 19 April 2018

»>I thank the reviewer for the time taken and for the comments made. My replies are behind »>

Review of the manuscript by H. van Haren Abyssal plain hills and internal wave turbulence

The author uses a line of high-resolution temperature sensors to find the interaction between small scale internal waves and large-scale shear near the bottom. Owing to the existence of internal waves and their breaking the stratification exists in thin stratified sheets and thicker layers between them. A highly variable near-bottom turbulent zone was found. Occasional solitary waves uplift the isotherms.

I know from the publications by van Haren that the NIOZ temperature sensors (many

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of them in a vertical line) are an important tool to study small scale processes in the ocean (line 169).

BGD

»>Thank you for the appreciation

Line 70 The author should cite his own important publications publication on the measurements in the Romanche FZ and Kane FZ: H. van Haren et al., Convective and shear-induced turbulence in the deep Kane Gap, *J. Geophys. Res.* V. 118, p. 5924–5930; H. van Haren et al., Extremely long Kelvin-Helmholtz billow trains in the Romanche Fracture Zone, *Geophys. Res. Lett.*, Vol. 41, 2014, p. 8445-8451.

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»>Those observations represent internal wave and shear-driven turbulence some distance from the bottom in through-flows. The results form a contrast with the present observations, because the near-bottom zone is stratified there despite relatively strong shear flow. It is similar with internal wave convection penetrating to close to the bottom, occasionally. Will mention this now, but later in the discussion.

line 74 Please cite one of the most comprehensive publications on internal wave generation by seamounts distributed over the ocean floor.[Baines PG (2007) Internal tide generation by seamounts. *Deep Sea Res* 54(9):1486–1508]

»>Yes of course, with the notion that Baines' modeling suggests that seamounts are of the some order (although less than) important for internal tide generation compared with continental slopes/Hawaiian Ridge. It also noted that Baines considered mounts with vertical scale height  $h > 1$  km, but the result may be transferrable to the perhaps even larger amount of hills, with  $h < 1$  km.

line 80 citation: Sloping large-scale topography has received more scientific interest than abyssal plains due to the higher turbulence intensity of internal wave breaking.

However, abyssal plains occupy a large part of the ocean and the processes that occur there deserve investigation. A contribution to these studies was made in Morozov 2018 in the regions of the hills in the Gambia Abyssal Plain, Madagascar Basin, and deep

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Pacific. In some of the regions the small hills on the bottom form corrugated topography instead of the seemingly flat bottom and contribute to internal wave generation and breaking.

»>Yes I agree, cited now.

line 132 I absolutely agree that: The small-scale topography may prove not negligible in comparison with large oceanic ridges, seamounts and continental slopes. This statement should be pronounced throughout the entire text.

»>Mentioned now in several places

line 141 I suggest that the authors indicates longitudes in the upper panel of Fig. 1.

»>OK done

In addition. A region north of the one analyzed in the manuscript was studied in [Mozozov 2018].

»>OK

line 694 I believe ETOPO and Smith&Sandwell are similar but different databases. They require different citations.

»>Yes, correct, modified now, as the S&S version Topo\_9.1b was used.

line 814 Figure 3 Reynolds not Revnolds number »>thank you

line 823 Figure 4. Please clarify that upper 100 are the upper 100 m of your line of thermistors not upper 100 m of the ocean.

»>Done now

Please explicitly indicate what processes are highlighted with black ellipses in the figures.

»>Thank you for pointing out, the locations were given in the text, but the coupling to

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the ellipses should have been given directly, as is done now.

I recommend the manuscript for publication after minor revision.

**BGD**

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Interactive comment on Biogeosciences Discuss., <https://doi.org/10.5194/bg-2018-142>, 2018.

Interactive  
comment